HEAT CONTROLLER, INC.

SERVICE MANUAL

Inverter Single Zone Ductless Mini Split Heat Pump

VMH Series Version C

VMH09SC-1
VMH12SC-1
VMH18SC-1
VMH24SC-1

Heat Controller, Inc. • 1900 Wellworth Ave. • Jackson, MI 49203 • (517)787-2100 • www.heatcontroller.com

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1. Precaution

1.1 Safety Precaution

- **To prevent injury to the user or other people and property damage, the following instructions must be followed.**
- **Incorrect operation due to ignoring instruction will cause harm or damage.**
- **Before service unit, be sure to read this service manual at first.**

1.2 Warning

➢ Installation

- **Do not use a defective or underrated circuit breaker. Use this appliance on a dedicated circuit.**

There is risk of fire or electric shock.

- **For electrical work, contact the dealer, seller, a qualified electrician.**

Do not disassemble or repair the product, there is risk of fire or electric shock.

- **Always ground the product.**

There is risk of fire or electric shock.

- **Install the panel and the cover of control box securely.**

There is risk of fire of electric shock.

- **Always install a dedicated circuit and breaker.**

Improper wiring or installation may cause flre or electric shock.

- **Use the correctly rated breaker of fuse.**

There is risk of fire or electric shock.

- **Do not modify or extend the power cable.**

There is risk of fire or electric shock.

- **Do not install, remove, or reinstall the unit by yourself(customer).**

There is risk of fire, electric shock, explosion, or injury.

- **Use caution when unpacking and installing the product.**

Sharp edges could cause injury, be especially careful of the case edges and the fins on the condenser and evaporator.

- **For installation, always contact the dealer.**

There is risk of fire, electric shock, explosion, or injury.

- **Do not install the product on a defective installation stand.**

It may cause injury, accident, or damage to the product.

- **Be sure the installation area does not deteriorate with age.**

If the base collapses, the air conditioner could fall with it, causing property damage, product failure, and personal injury.

- **Do not let the air conditioner run for a long time when the humidity is very high and a door or a window is left open.**

Moisture may condense and wet or damage furniture.

- **Take care to ensure that power cable can not be pulled out or damaged during operation.**

There is risk of fire or electric shock.

- **Do not place anything on the power cable.**

There is risk of fire or electric shock.

- **Do not plug or unplug the power supply plug during operation.**

There is risk of fire or electric shock.

- **Do not touch (operation) the product with wet hands.**

There is risk of fire or electric shock.

- **Do not place a heater or other appliance near the power cable.**

There is risk of fire and electric shock.

- **Do not allow water to run into electric parts.**

It may cause fire, failure of the product, or electric shock.

- **Do not store or use flammable gas or combustible near the product.**

There is risk of fire or failure of product.

- **Do not use the product in a tightly closed space for a long time.**

Oxygen deficiency could occur.

- **When flammable gas leaks, turn off the gas and open a window for ventilation before turn the product on.**

Do not use the telephone or turn switches on or off.

There is risk of explosion or fire.

- **If strange sounds, or small or smoke comes from product. Turn the breaker off or disconnect the power supply cable.**

There is risk of electric shock or fire.

- **Stop operation and close the window in storm or hurricane. If possible, remove the product from the window before the hurricane arrives.**

There is risk of property damage, failure of product, or electric shock.

- **Do not open the inlet grill of the product during operation. (Do not touch the electrostatic filter, if the unit is so equipped.)**

There is risk of physical injury, electric shock, or product failure.

- **When the product is soaked (flooded or submerged), contact an your dealer.**

There is risk of fire or electric shock.

- **Use caution that water could not enter the product.**

There is risk of fire, electric shock, or product damage.

- **Ventilate the product from time to time when operating it together with a stove, etc.**

There is risk of fire or electric shock.

- **Turn the main power off when cleaning or maintaining the product.**

There is risk of electric shock.

- **When the product is not be used for a long time, disconnect the power supply plug or turn off the breaker.**

There is risk of product damage or failure, or unintended operation.

- **Take care to ensure that nobody can step on or fall onto the outdoor unit.**

This could result in personal injury and product damage.

➢ CAUTION

- **Always check for gas (refrigerant) leakage after installation or repair of product.**

Low refrigerant levels may cause failure of product.

- **Install the drain hose to ensure that water is drained away properly.**

A bad connection may cause water leakage.

- **Keep level even when installing the product.**

To avoid vibration of water leakage.

- **Use two or more people to lift and transport the product.**

Avoid personal injury.

- **Do not install the product where it will be exposed to sea wind (salt spray) directly.**

It may cause corrosion on the product. Corrosion, particularly on the condenser and evaporator fins, could cause product malfunction or inefficient operation.

➢ Operational

- **Do not expose the skin directly to cool air for long periods of time. (Do not sit in the draft).**

This could harm to your health.

- **Do not use the product for special purposes, such as preserving foods, works of art, etc. It is a consumer air conditioner, not a precision refrigerant system.**

There is risk of damage or loss of property.

- **Do not block the inlet or outlet of air flow.**

It may cause product failure.

- **Use a soft cloth to clean. Do not use harsh detergents, solvents, etc.**

There is risk of fire, electric shock, or damage to the plastic parts of the product.

- **Do not touch the metal parts of the product when removing the air filter. They are very sharp.**

There is risk of personal injury.

- **Do not step on or put anything on the product. (outdoor units)**

There is risk of personal injury and failure of product.

- **Always insert the filter securely. Clean the filter every two weeks or more often if necessary.**

A dirty filter reduces the efficiency of the air conditioner and could cause product malfunction or damage.

- **Do not insert hands or other object through air inlet or outlet while the product is operated.**

There are sharp and moving parts that could cause personal injury.

- **Do not drink the water drained from the product.**

It is not sanitary could cause serious health issues.

- **Use a firm stool or ladder when cleaning or maintaining the product.**

Be careful and avoid personal injury.

- **Replace the all batteries in the remote control with new ones of the same type. Do not mix old and mew batteries or different types of batteries.**

There is risk of fire or explosion.

- **Do not recharge or disassemble the batteries. Do not dispose of batteries in a fire.**

They may burn of explode.

- **If the liquid from the batteries gets onto your skin or clothes, wash it well with clean water. Do not use the remote of the batteries have leaked.**

The chemical in batteries could cause burns or other health hazards

2. Function

Indoor unit

- **Operation by remote controller**
- **Sensing room temperature**

  Room temperature sensor
  Pipe temperature sensor
- **Room temperature control**

  Maintains the room temperature according to the set temperature
- **Anti-freeze protection in cooling**

  Prevents condensate from freezing on evaporator by sensing the evaporator pipe temperature in cooling mode
- **Time Delay Safety control**

  Restart is for approx. 3 minutes
- **Indoor fan speed control**

  Turbo, high, med, low, breeze
- **Two-direction air vane**

  The unit will decide the louver direction according to operation mode
- **Sleep mode auto control**

  The fan is turned to low speed in both cooling and heating
- **Independent dehumidification**

  The function is usually used in rainy days in springtime or damp areas
- **Air flow Direction control**

  The louver can be set at the desired position or swing up and down automatically
- **Auto mode**

  The mode can be change by the room temperature
- **Temp. Compensation**
- **Indoor golden fin**
- **Ionizer**
- **Follow me**
- **Timer function**
- **Self-diag. function**
- **Anti-cold function**

  Prevent the cold wind at the beginning of unit start.
- **Auto defrost**
- **Auto-restart function**

  When the power supply is interrupted and then restored, the unit automatically restarts at the previous function setting.

Outdoor unit

Compressor delay

3 minute time delay between ON/OFF operation.

Low noise air flow system

Bird tail propeller fan makes the outdoor unit run more quietly.

Hydrophilic aluminum fin

4 way valve control

Energized in the heating mode except when in defrost.

Anti-rust cabinet

Made from electrolytic zinc steel and anti-rust coated components.

Valve protection cover

Protects the valves and prevents water from dripping.

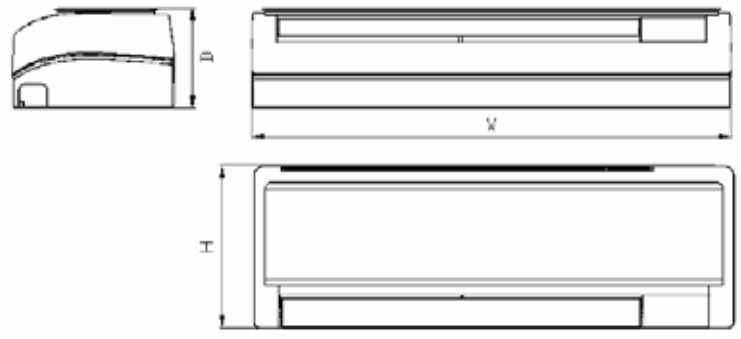
Discharge pipe temperature protection

Crankcase heater chassis heater for some full DC inverter outdoor units

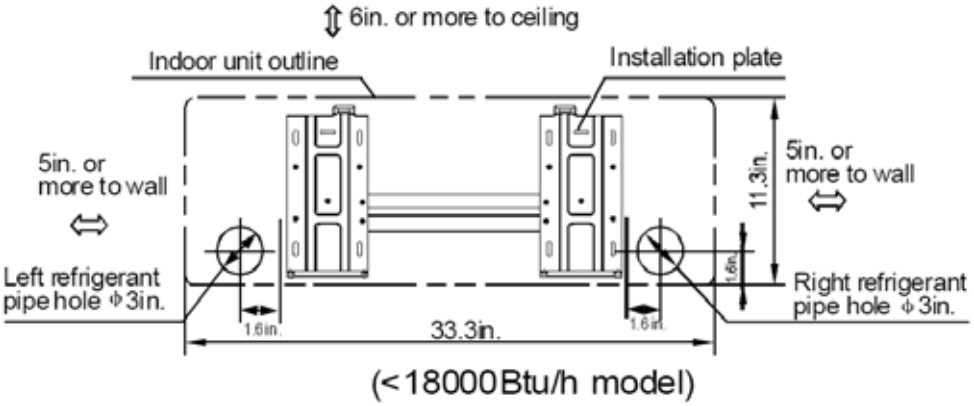
Operates down to 5°F(15°C)

3. Dimension

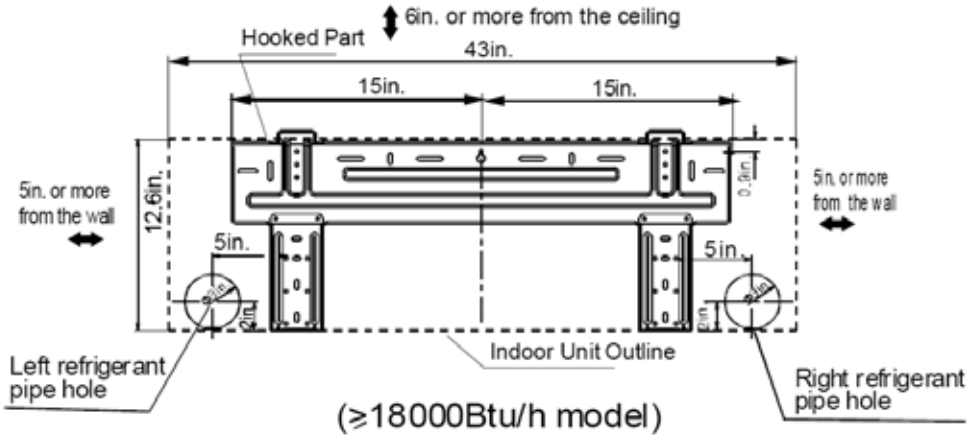
3.1 Indoor Unit



Model	Dimension (mm)		
	W	H	D
B-VMH09SC B-VMH12SC	845 (33.3in)	286 (11.3in)	165 (6.5in)
B-VMH18SC B-VMH24SC	1080 (42.5in)	320 (12.6in)	200 (7.9in)

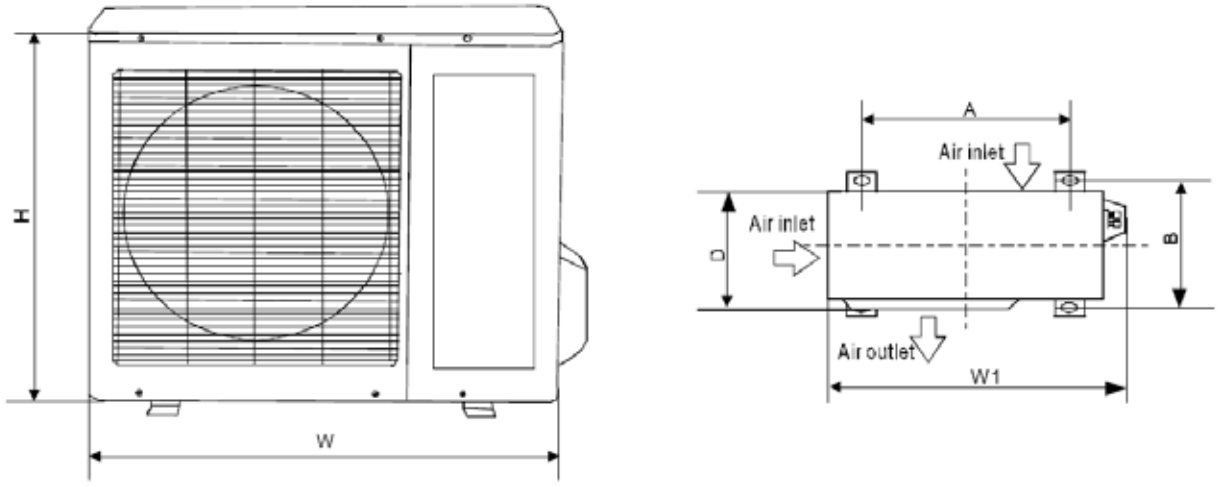


(<18000Btu/h model)



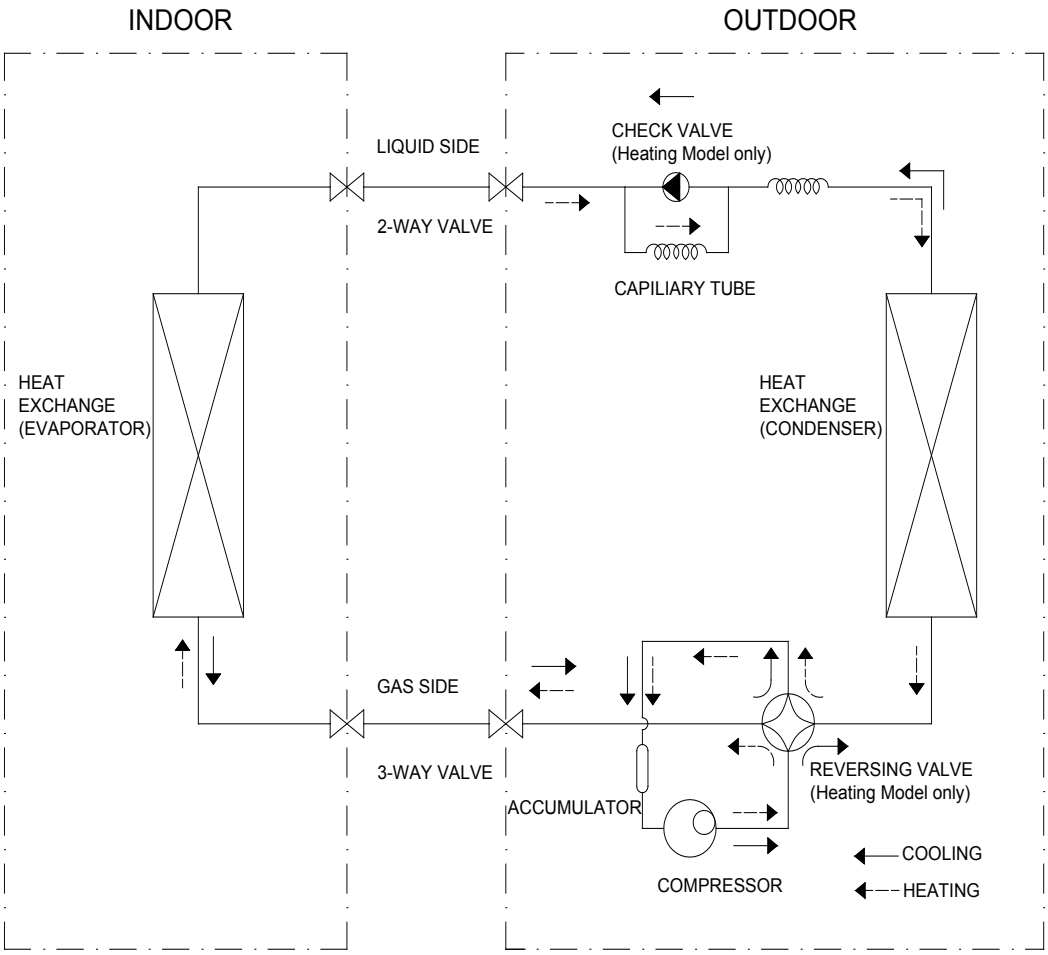
(≥18000Btu/h model)

3.2 Outdoor Unit



Model	Dimension (mm)					
	W	D	H	W1	A	B
A-VMH09SC	760 (29.9in)	285 (11.2in)	590 (23.2in)	823 (32.4in)	530 (20.9in)	290 (11.4in)
A-VMH12SC						
A-VMH18SC	845 (33.3in)	335 (13.2in)	695 (27.4in)	918 (36.1in)	560 (22.0in)	335 (13.2in)
A-VMH24SC	895 (35.2in)	330 (13.0in)	860 (33.9in)	975 (38.4in)	590 (23.2in)	333 (13.1in)

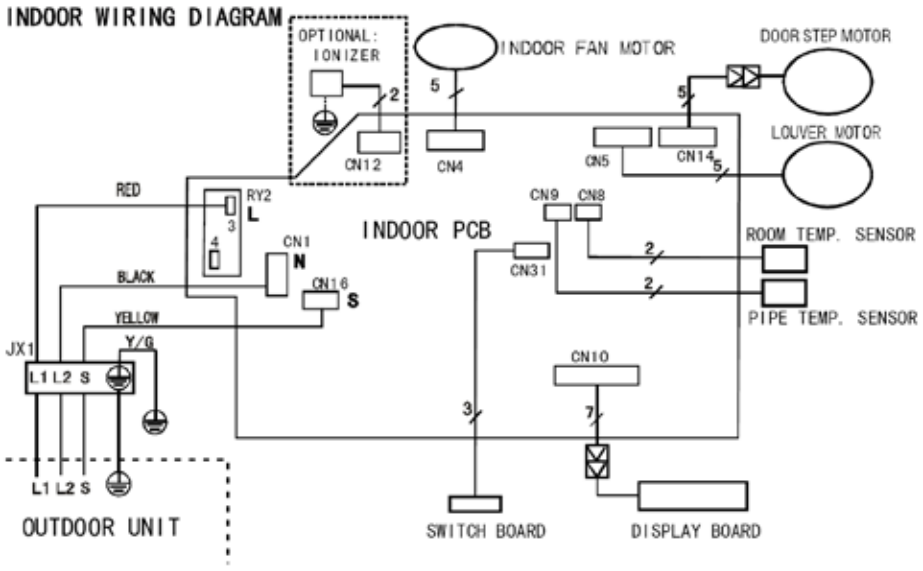
4. Refrigerant Cycle Diagram:



5. Wiring Diagrams:

5.1 Indoor Units

B-VMH09SC-1 B-VMH12SC-1



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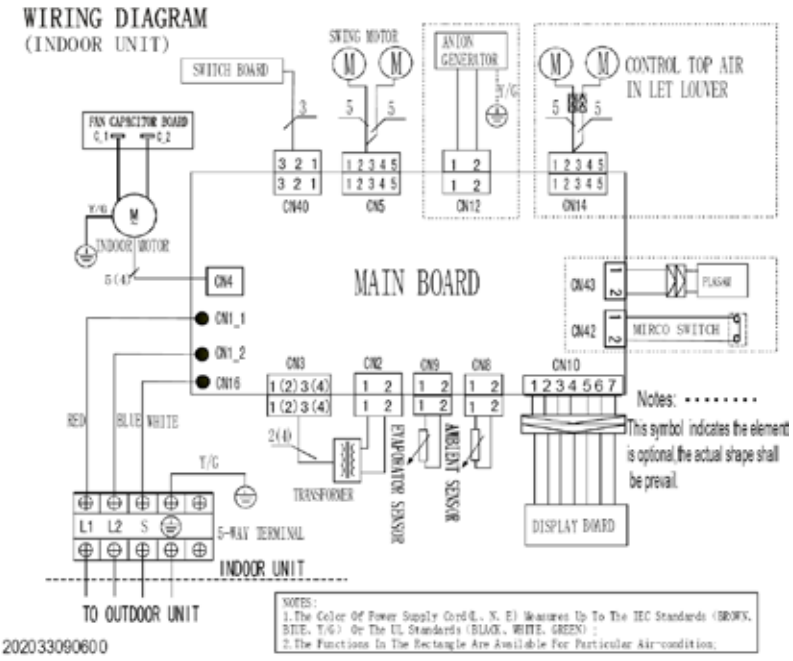
B-VMH18SC-1 B-VMH24SC-1



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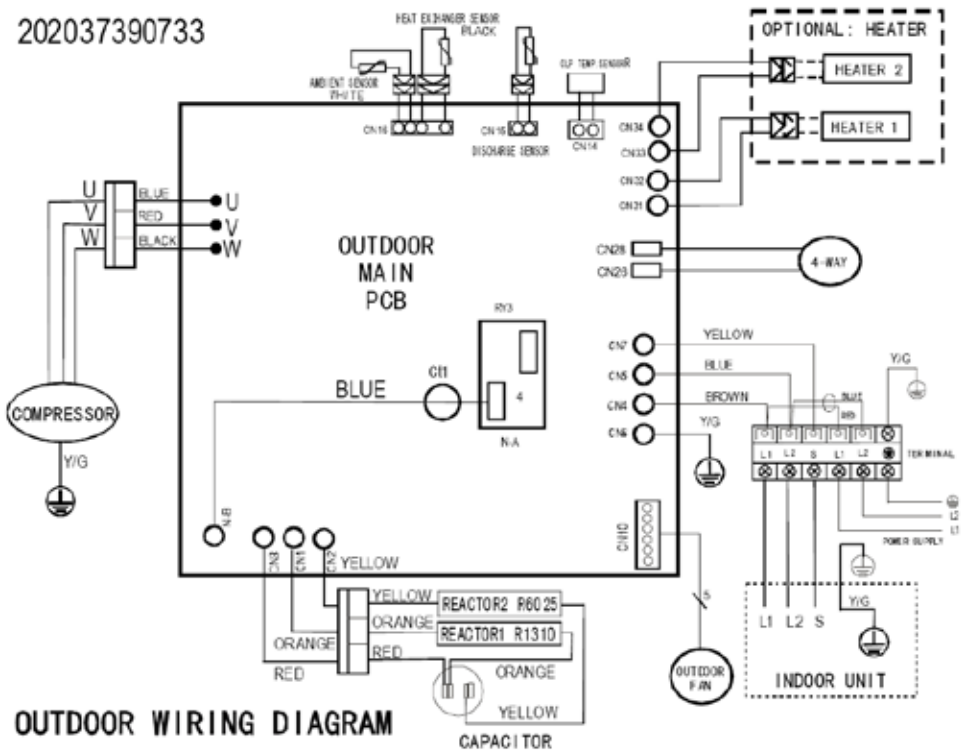
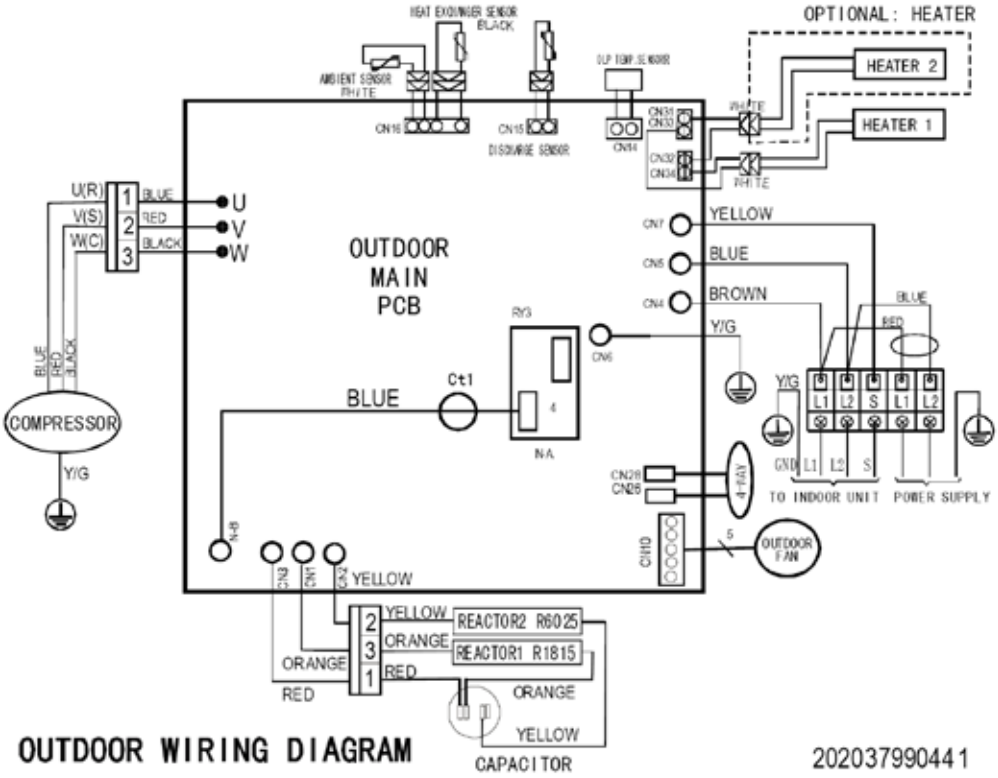
5.2 Outdoor Unit

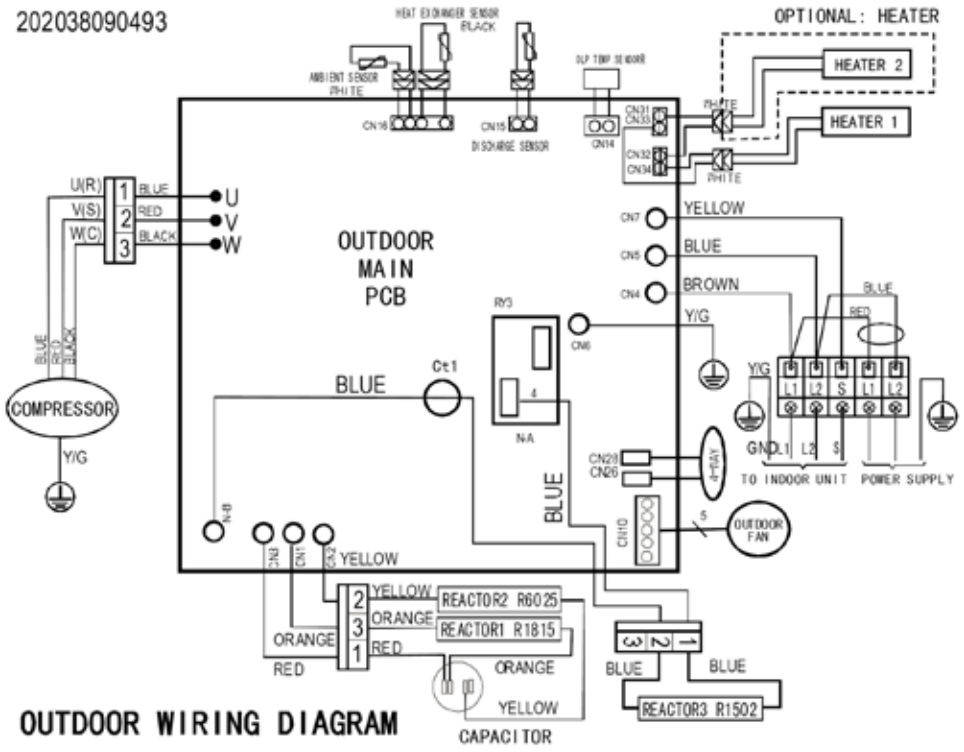
A-VMH09SC-1 A-VMH12SC-1



A-VMH18SC-1



A-VMH24SC-1



6. Installation details:

6.1 Power Wiring

- Consult local building codes, NEC (National Electrical Code) or CEC (Canadian Electrical Code) for special requirements.

  Connection Cable: Voltage drop on the connecting cable should be kept to a minimum. The operating voltage will vary between – 24V to +24V DC.

  Use cable size listed below:

MODEL SIZE	POWER SOURCE	MIN CKT AMP MAX FUSE/CB AMP	AWG (min) Connecting Cable** (outdoor to indoor)
9K	208/230-60-1	15/20	14/4 COPPER STRANDED
12K			
18K			
24K			

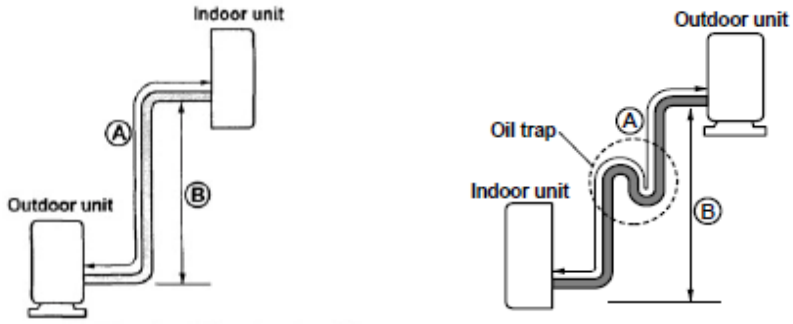
6.2 Pipe length and the elevation:

1. Single Zone "V" Series Inverter System:

Capacity	Pipe Size		Standard	Max	Total		Additional
Btu/h	Gas	Liquid	Length Ⓐ	Elevation Ⓑ	Line Length (ft) Ⓐ		Refrigerant
	(in)	(in)	(ft)	(ft)	Min.	Max.	oz/ft
9k	3/8	1/4	*16.5	26	10	65.5	.2
12k	1/2	1/4	*16.5	26	10	65.5	.2
18k	1/2	1/4	*16.5	32	10	82	.2
24k	5/8	3/8	*16.5	32	10	82	.4

Refrigerant Charge (oz)	
Unit Model #	Heat Pump
VMH09SC	38.8 oz.
VMH12SC	44.1 oz.
VMH18SC	58.2 oz.
VMH24SC	67.0 oz.

***Unit charge located on rating plate includes enough refrigerant for 16.5 feet of line set.**
***Charge adjustment is not required on line set lengths less than 16.5 feet.**
***Capacity is based on standard line set lengths and maximum length is based on reliability.**



Oil Traps:

It is not necessary to install oil traps when outdoor unit is located lower than indoor unit.

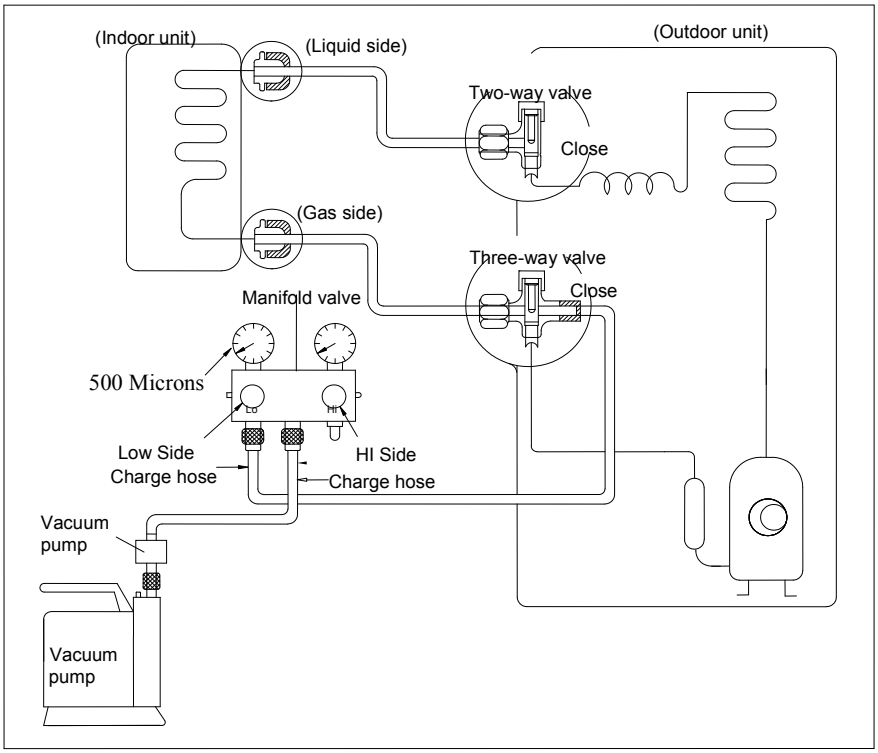
It is recommended that a trap be installed when outdoor unit is installed 16.5' higher than indoor unit.

6.3 Pressure Test & Evacuation

Air and moisture in the refrigerant system have undesirable effects as below:

- Pressure in the system rises.
- Operating current rises.
- Cooling or heating efficiency drops.
- Moisture in the refrigerant circuit may freeze and block capillary tubing.
- Refrigerant lines and indoor coil should be evacuated using the recommended deep vacuum method of 500 microns. The alternate triple evacuation method may be used if the procedure outlined is followed.

1. System Evacuation and Charging



1) Completely tighten the flare nuts of the indoor and outdoor units, connect manifold gauge low side hose to low side service valve.
2) Connect the manifold gauge charge hose to the vacuum pump.
3) Fully open the low side of manifold gauge.
4) Start vacuum pump.
5) Evacuate using either deep vacuum or triple evacuation method.
6) After evacuation is complete, fully close the low side of manifold gauge and shut off vacuum pump.
7) The factory charge contained in the outdoor unit is good for up to 16.5 ft. of line length. For line set lengths over 16.5 ft., adjust charge according to chart in section 6.2.
8) Disconnect charge hose from low side service valve.
9) Fully open both high and low side service valves and securely tighten caps.

2. Deep Vacuum Method

The deep vacuum method requires a vacuum pump capable of pulling a vacuum of 500 microns and a vacuum of 500 microns and vacuum gage capable of accurately measuring the vacuum depth. The deep vacuum method is the most positive way of assuring a system is free of air and liquid water.

1. Vacuum pressure should pull down below 500 microns in 2 minutes.
2. Evacuate system for 30 minutes.
3. Shut valve to vacuum pump off.
4. After 10 minutes read pressure.
   If pressure remains below 1000 microns, system is ready.
   If pressure is between 1000 and 2000 microns continue evacuation for additional 30 minutes.
   If pressure is above 2000 microns, there is a leak in the system.

3. Triple Evacuation Method

The triple evacuation method should only be used when vacuum pump is only capable of pumping down to a 28" Hg. vacuum and system does not contain any liquid water.

1. Pump system down to 28"Hg. and allow pump to continue operating for an additional 15 minutes.
2. Close high and low side valves on gauge manifold and shut off vacuum pump.
3. Connect a nitrogen cylinder and regulator to system and open until system pressure is 2 psig.
4. Close service valve and allow system to stand for 1 hour. This will allow dry nitrogen to diffuse throughout the system absorbing moisture.
5. Complete this procedure until system until it is able to hold a deep vacuum then release charge into system.

4. Final Tubing Check

IMPORTANT: Check to be certain factory tubing on both indoor and outdoor unit has not shifted during shipment. Ensure tubes are not rubbing against each other or any sheet metal. Pay close attention to feeder tubes, making sure wire ties on feeder tubes are secure and tight.

7. Operation characteristics

Mode / Temperature	Cooling operation	Heating operation	Drying operation
Room temperature	≥17℃(62℉)	≤30℃(88℉)	>10℃(50℉)
Outdoor temperature	0℃~50℃ (32℉~122℉)	-15℃~34℃ (5℉~92℉)	0℃ ~50℃ (32℉~122℉)
	(-15℃~50℃/5℉~122℉: For the models with low temperature cooling system)		

CAUTION:

1. Operation of air conditioner beyond the above conditions may cause certain protections to occur.
2. Room relative humidity should be less than 80%. If the air conditioner operates in excess of this value, the surface of the air conditioner may cause condensation. If condensation does occur, place the vertical air louver to it's maximum angle (vertically to the floor) and set the fan to high speed.

8. Electronic function

8.1 Abbreviation

T1: Indoor room temperature

T2: Coil temperature of evaporator

T3: Coil temperature of condenser

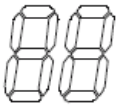
T4: Outdoor ambient temperature

T5: Compressor discharge temperature

TS: Preset temperature.

8.2 Display function

8.2.1 Icon explanation on indoor display board.

	TIMER display Illuminated during Timer operation.
	CLEAN AIR display(optional) Illuminated when Ionizer is activated.
	TURBO operation display Illuminated when TURBO function is selected in cooling or in heating mode.
	**DIGITAL DISPLAY** Display's the current set temperature or fault error code when the air conditioner is in operation. When the SELF CLEAN feature is activated, it display's. "SC"
	FAN SPEED display Display's the selected fan speed: LOW( ), MED( ) and HIGH( ).
	Operation Frequency display This display is separated into five zones. The zones illuminate based on the compressor current frequency. For example, higher frequency will illuminate more zones.

8.3 Main Protection

8.3.1 Three Minute Time Delay at restart for compressor.

1 minute delay for 1st time start-up and 3 minute delay for others.

8.3.2 Temperature protection of compressor top.

Protector cuts off compressor for 30 seconds and restarts after 3 minute delay.

8.3.3 Temperature protection of compressor discharge.

When the compressor discharge temperature increases, the compressor frequency will be limited as indicated below:

- Compressor discharge temp. T5>239°F/115°C for 5 seconds, compressor stops.
- If T5<239°F/115°C, decreases compressor frequency to the lower level every 3 minutes.
- T5>194°F/90°C, cancels the frequency limit control and restarts the compressor.

8.3.4 Fan Speed is out of control.

When indoor fan speed is lower than 300 RPM for 50 second, the whole unit stops and LED displays error code E3, and the unit will not resume operation automatically.

8.3.5 Inverter module Protection.

Inverter module protection has a protection function against current, voltage and temperature. If any of these conditions occur, the corresponding code will display on indoor unit LED and A/C will stop. Once the code is cleared unit will restart after the 3 min delay.

8.3.6 Indoor fan delayed open function

When the system starts up, the louver will be active immediately and the indoor fan will open 10 seconds later.

If the system is in heating mode, the anti-cold wind function has priority.

8.3.7 Compressor preheating functions.

Preheat conditions:

- If the main relay closes, T4＜37°F/3°C and the unit is powered on, or T4＜37°F/3°C and compressor has stopped over 3 hours, the compressor heating cable will operate.

Preheat mode:

- With the compressor off, a small amount of current flows through the windings of the compressor heating the crankcase.

Preheat termination:

- If T4＞41°F/5°C or user turns on the machine and compressor runs, preheating function will stop.
- Crankcase heater starts when T4<41°F/5°C and stops when T4>59°F/15°C.

8.4 Operation Modes and Functions

8.4.1 Fan only mode.

(1) Outdoor fan and compressor stop.

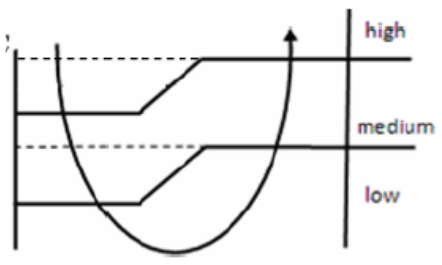
(2) Temperature set function is disabled, and no set temperature is displayed.

(3) Indoor fan can be set to high/med/low/auto.

(4) The louver operates same as in cooling mode.

(5) The action of auto fan in fan-only mode is the same as auto fan in cooling mode within 75°F/24°C of the set temperature.

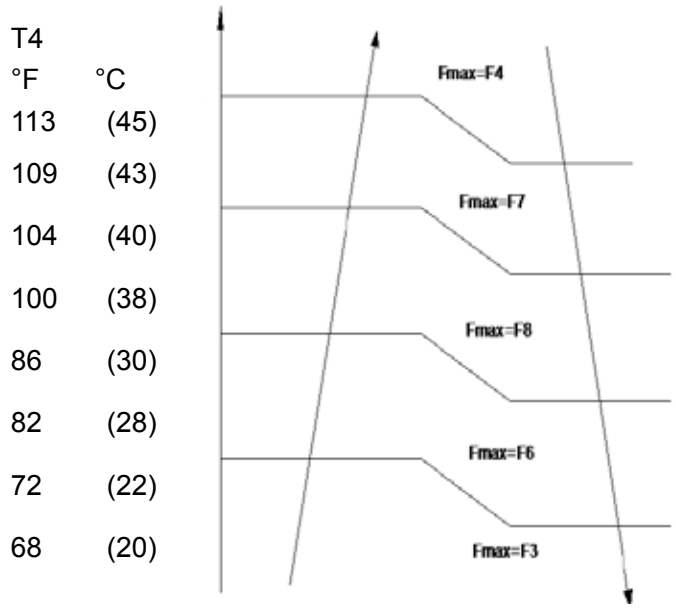
°F	°C
81.5	(27.5)
80.6	(27.0)
77.9	(25.5)
77.0	(25.0)



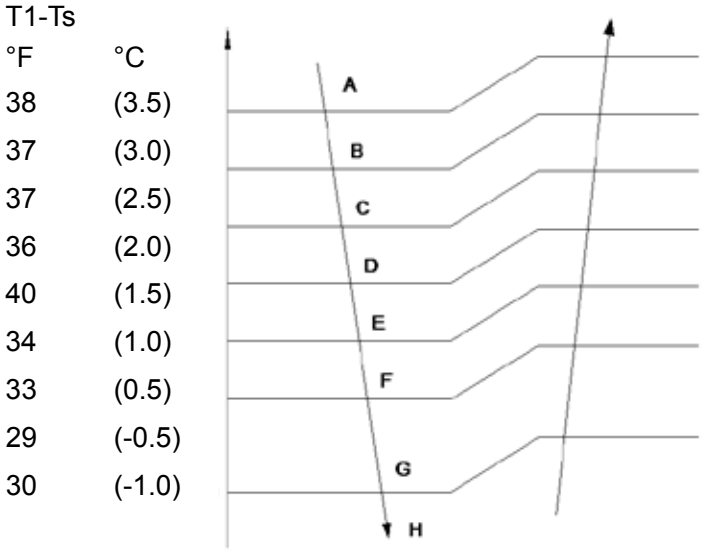
8.4.2 Cooling Mode

8.4.2.1 Compressor running rules:

The operating frequency of compressor after starting submits to following rule.



If users switch on A/C by remote controller, the compressor will run at the Fmax frequency for 7 minutes according to outdoor ambient temp. During the 7 minutes, frequency limitation is active.
7 minutes later, the compressor running frequency will be controlled as below:



While

Temp. zone	A	B	C	D	E	F	G
Frequency	F8	F8	F7	F6	F5	F3	F1

Note:

When T1-Ts stays in the same temp. zone for 3 minutes, the compressor will run as follows:

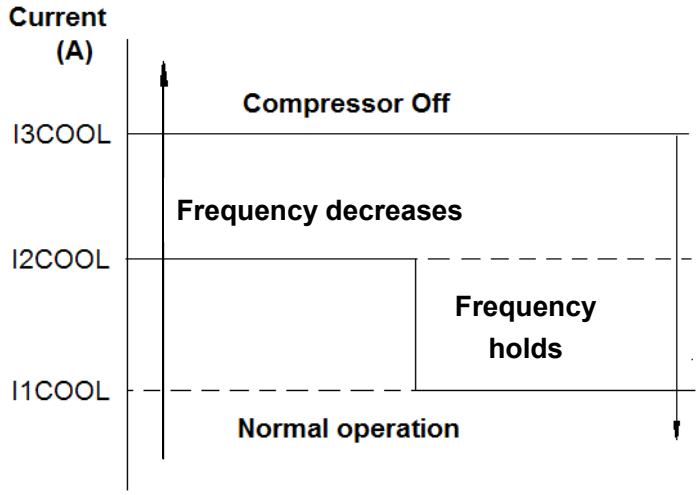
A~E: Increases the frequency to level F8.

F: Maintains the current frequency.

G: Decreases the frequency to the lower level F1.

H: Runs at F1 for 1h.(if T1-Ts<28°F/-2°C, compressor will stop)

Meanwhile, the compressor running frequency is limited by the current.



If the current increases more than I2COOL, the frequency will decrease automatically, if the current raises to over I3COOL, the compressor will stop and restart 3min later.

When the frequency decreases and the current deceases to between I1COOL and I2COOL, the frequency will hold. If the frequency does not change for 3min, the frequency will increase to a higher level, and it can increase twice at most.

If the current deceases to lower than I1COOL, the frequency limit will be invalid.

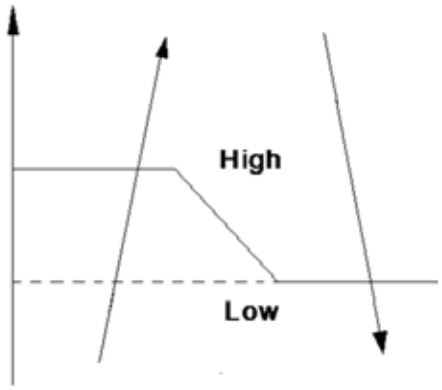
Model	Current		
	I1COOL	I2COOL	I3COOL
VMH09SC-1	5.2	6.4	7.5
VMH12SC-1	5.2	6.4	7.5
VMH18SC-1	5.2	6.4	7.5
VMH24SC-1	10	11	13

8.4.2.2 Outdoor fan rules:

Outdoor fan and compressor start at the same time, outdoor fan stops 30s after the compressor stops.

The outdoor fan has two speeds, and is controlled by T4 as follows:

T4	
°F	°C
72	(22)
68	(20)

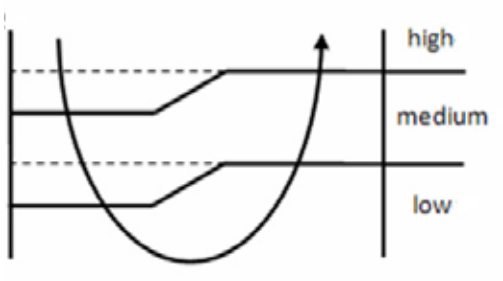


8.4.2.3 Indoor fan running rules

In cooling mode, indoor fan runs all the time and the speed can be selected as high, medium, low and auto.

Auto fan in cooling mode acts as follow:

T1-Ts	
°F	°C
7°	(4.0)
5°	(3.0)
3°	(1.5)
2°	(1.0)



8.4.2.4 Condenser high temperature T3 protection.

When 131°F/55°C <T3< 140°F/60°C, the compressor frequency will decrease to the lower level every 3 min until to F1 and then run at F1.

When T3<129°F/54°C the compressor will keep running at the current frequency.

When T3<126°F/52°C the compressor will not limit the frequency again and resume to the former frequency.

When T3>140°F/60°C for 5 seconds, the compressor will stop and restart until T3<126°F/52°C.

8.4.2.5 Evaporator low temperature T2 protection.

When T2<32°F/0°C, the compressor will stop and restart when T2>41°F/5°C.

When 32°F/0°C≤T2<39°F/4°C, the compressor frequency is limited and decreases to the lower level every minute until stop the compressor stops.

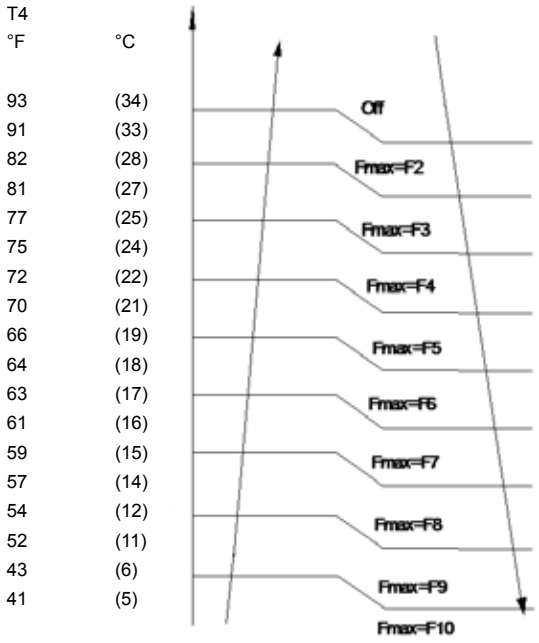
When 39°F/4°C ≤T2≤45°F/7°C, the compressor will keep the current frequency.

When T2>45°F/7°C, the compressor frequency will not be limited.

8.4.3 Heating Mode

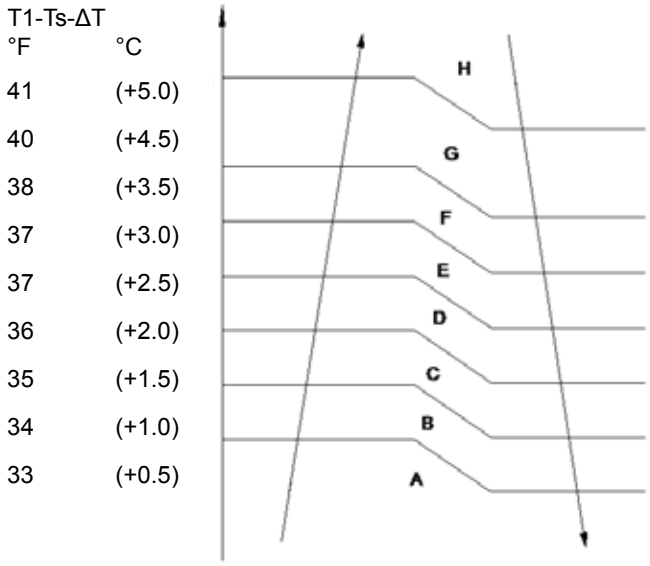
8.4.3.1 Compressor running rules:

The operation frequency of compressor after starting submits to following rule.



After A/C starts up, the compressor will run at the Fmax frequency for 7 minutes according to outdoor ambient temp. During the 7 minutes, frequency limitation is active.

7 minutes later, compressor running frequency will be controlled as below:



While

Temp. zone	A	B	C	D	E	F	G
Frequency	F10	F9	F8	F7	F5	F3	F4

ΔT=32°F/0°C as default.

Note:

When T1-Ts stays in the same temp. zone for 3 minutes, the compressor will run as follows:

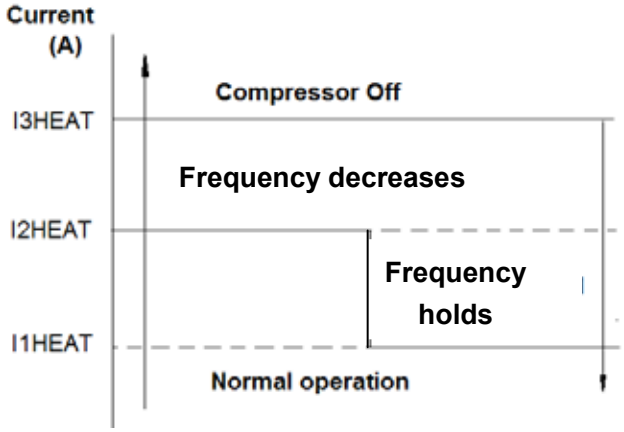
A~E: Increase the frequency to the higher level F10.

F: Keeps the current frequency.

G: Decreases the frequency to the lower level F1.

H: Runs at F1 for 1h. (If T1-Ts-ΔT >43°F/6°C, compressor will stop)

Meanwhile, the compressor running frequency is limited by the current.



If the current increases more than I2HEAT, the frequency will decrease automatically, if the current raises to over I3HEAT,, the compressor will stop and restart 3min later.

During the frequency decreasing, if the current deceases to between I1HEAT, and I3HEAT,, the frequency will hold. If the frequency not does not for 3min, frequency will increase to a higher level, and it can increase twice at most.

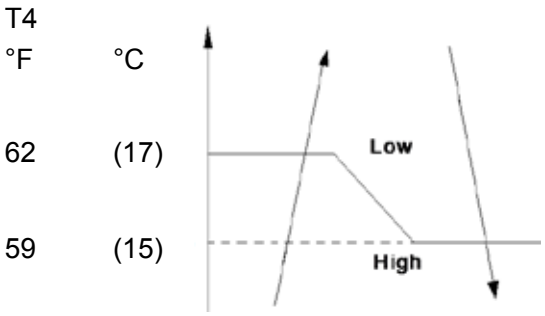
If the current deceases to lower than I1HEAT, the frequency limit will be invalid.

Model	Current		
	I1HEAT	I2HEAT	I3HEAT
VMH09SC-1	5.2	6.4	7.5
VMH12SC-1	5.2	6.4	7.5
VMH18SC-1	5.2	6.4	7.5
VMH24SC-1	10	11	13

8.4.3.2 Outdoor fan running rules:

Outdoor fan and compressor start up at the same time, outdoor fan stops 30s after the compressor stops.

The outdoor fan has two speeds, and is controlled by T4 as follows:



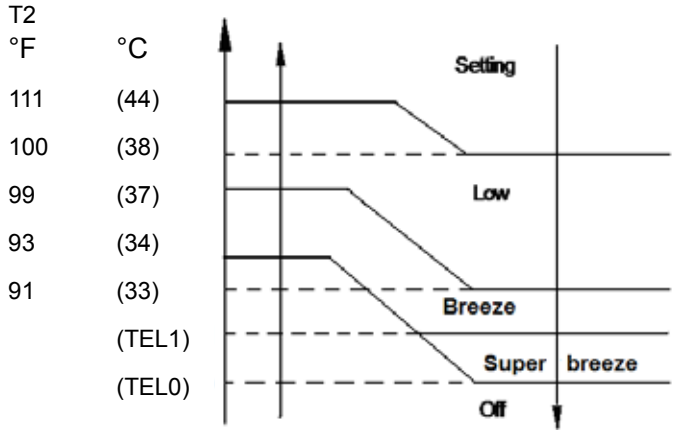
8.4.3.3 Indoor fan rules:

The indoor fan speed can be selected as high, medium, low and auto, the anti-cold-wind function has the priority.

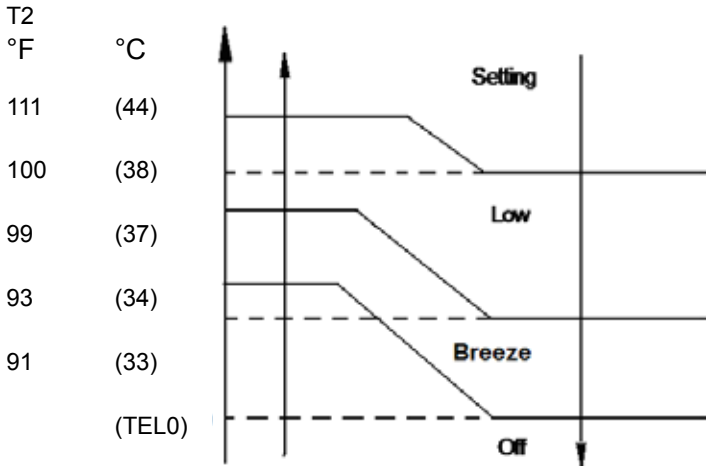
If set temperature is reached, the indoor fan switches to lowest speed, the anti-cold wind function has priority.

If operation mode is changed or compressor restarts, indoor fan works in set fan speed.

Anti-cold-wind function control principle:



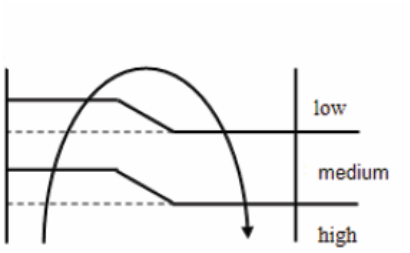
Unit	TEL0 (℃)	TEL1 (℃)
VMH09SC-1	63°F/17°C	75°F/24°C
VMH12SC-1		



Unit	TEL0 (℃)
VMH18SC-1	75°F/24°C
VMH24SC-1	

Auto fan action in heating mode.

T1-Ts-ΔT	
°F	°C
5°	(2.5)
4°	(2.0)
3°	(1.5)
2°	(1.0)



8.4.3.4 Defrost mode：

Conditions of defrost:

When the unit is running, if any one of the following conditions is satisfied, the unit starts defrost:

1 .Defrost is available after 40 minutes of run time if T3 (Condenser coil temperature) is＜37°F/3°C and there is a 11°F/6°C temperature difference for 3 minutes.

2. Defrost is available after 80 minutes of run time if T3 (Condenser coil temperature) is＜37°F/3°C and there is a 7°F/4°C temperature difference for 3 minutes.

3. Defrost is available after 120 minutes of run time if T3 Condenser coil temperature) is＜37°F/3°C and there is a 4°F/2°C temperature difference for 3 minutes.

4. If any of the above conditions are satisfied and the T2 (Evaporator coil temperature) has decreased 9°F/5°F below the normal maximum indoor pipe temperature, unit starts defrost.

Note: T2 is the maximum value of the evaporator temperature during the anti-cold wind function. It's recorded by the system automatically.

Terminating defrost:

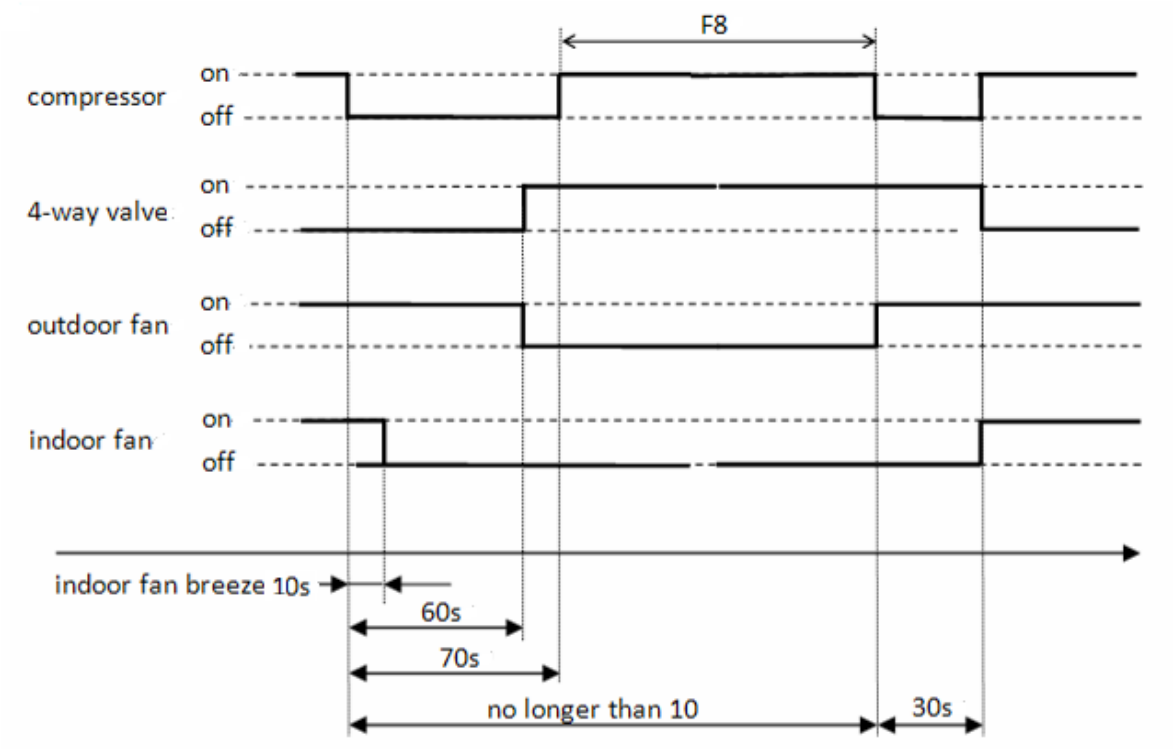
If any one of following items is satisfied, defrost will stop and unit will return to normal heating mode.

1 .Defrost time has reached 10 minutes

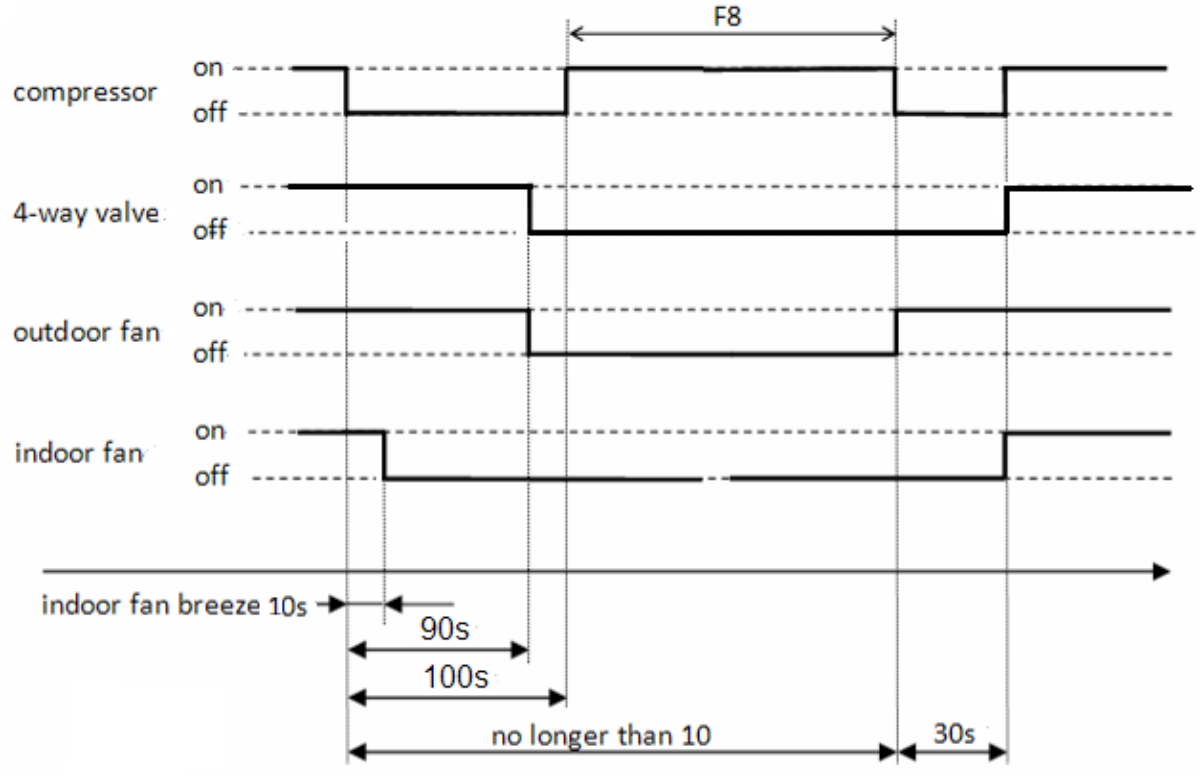
2 .T3 (Condenser coil temperature) >46°F/8°C for 80 seconds.

Defrost Actions:

For 9K and 12K unit



For 18K and 24K unit



8.4.3.5 High evaporator coil temp.T2 protection:

(1) T2>TEH2 compressor running frequency decreases to the lower level every 20s. If the frequency decreased to F2 and the T2 still over TEH2 for 3 minutes, the compressor will stop. If T2 deceased to lower than 118°F/48°C, or 118°F/48°C <T2< TEH2 last for 6 minutes, release the frequency limit control.

Unit	°F **TEH2 (**°C**)**
9K/12K	127°F 53°C
18K /24K	131°F 55°C

(2) If T2>140°F/0°C, the compressor stops and restarts when T2<118°F/48°C

8.4.4 Auto-mode

This mode can be selected by the remote control and the set temperature can be changed between 17~86°F/62°C.

In auto mode, the machine will select cooling, heating or fan-only mode according to the difference between T1 and Ts.

T1-Ts	Running mode
T1-Ts＞1°F	Cooling
-1< T1-Ts ≤1°F	Fan-only
T1-Ts ≤-1°F	Heating

Indoor fan will run in auto fan of the relevant mode.

The louver operates the same as in relevant mode.

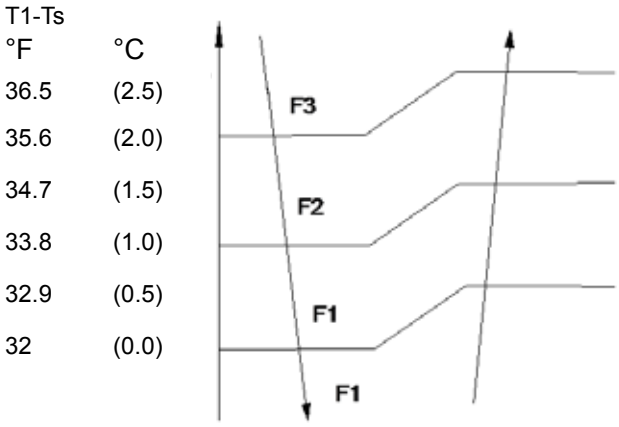
If the machine switches mode between heating and cooling, the compressor will stop for 15 minutes and then choose mode according to T1-Ts again.

If the set temperature is modified, the unit will choose run function again.

8.4.5 Dehumidify mode

8.4.5.1 Indoor fan speed is fixed in breeze and can't be changed. The louver angle is the same as in cooling mode.

8.4.5.2 Compressor running rules



8.4.5.3 Room low temperature protection

If room temperature is lower than 50°F/10°C, compressor will stop and not resume operation until room temperature is over 54°F/12°C.

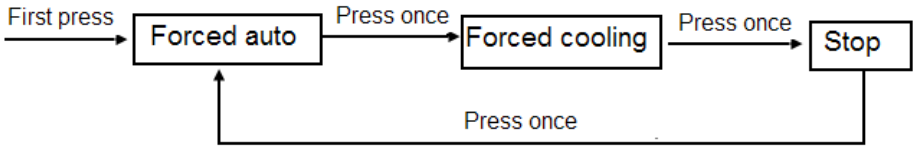
8.4.5.4 Evaporator anti-freeze protection, condenser high temperature protection and outdoor unit frequency limit are valid, and they are the same as that in cooling mode.

8.4.5.5 The outdoor fan operates same as in cooling mode.

8.4.6 Forced operation function

8.4.6.1 Enter forced operation function:

Pressing the touch button once, the machine will transfer into forced auto mode, pressing the button once again, the machine will turn into forced cooling mode, the third press will stop the unit, and the forth press is the start of the cycle of forced auto mode. Refer to the following chart:



8.4.6.2 In forced operation mode, all general protections and remote control functions are available.

8.4.6.3 Operation rules:

Forced cooling mode:

The compressor runs at F2 frequency and indoor fan runs as breeze. After running for 30 minutes. the machine will turn to auto mode at 75°F/24°C set temperature.

Forced auto mode:

The action of forced auto mode is the same as normal auto mode with 75°F/24°C set temperature.

8.4.7 Timer function

8.4.7.1 Timing range is 24 hours, and the minimum resolution is 15 minutes.

8.4.7.2 Timer on. After turning off, the machine will turn on automatically when set time is reached.

8.4.7.3 Timer off. After turning on, the machine will turn off automatically when set time is reached.

8.4.7.4 Timer on/off. After turning off, the machine will turn on automatically when it has reached the set "on" time, and then turn off automatically when it has reached the set "off" time.

8.4.7.5 Timer off/on. After turning on, the machine will turn off automatically when it has reached the set "off" time, and then turn on automatically when it has reached the set "on" time.

8.4.7.6 The set time is relative time.

8.4.7.7 The tolerance of timer is 1 minute per hour.

8.4.8 Sleep function mode

8.4.8.1 Operation time in sleep mode is 7 hours. After 7 hours the AC quits this mode and turns off.

8.4.8.2. Operation process in sleep mode is as follow:

Sleep mode is selected by pressing the economic or sleep button on the remote control the first hour 2°F the second hour.

In cooling, the set temperature rises 2°F/1°C (be lower than 86°F/30°C) every one hour, 2 hours later the set temperature stops rising and indoor fan is fixed as low speed.

When heating, the setting temperature decreases 2°F/1°C (be higher than 63°F/17°C) the first hour 2°F the second hour, 2 hours later the set temperature stops decreasing and indoor fan is fixed as low speed.(Anti-cold wind function has the priority)

8.4.8.3 Timer setting is available

8.4.8.4 When user uses timer off function in sleep mode (or sleep function in timer off mode), if the timing is less than 7 hours, sleep function will be cancelled when the set time reached. If the timing is more than 7 hours, the machine will not stop until it reaches the set time in sleep mode.

8.4.9 Auto-Restart function

The indoor unit is equipped with auto-restart function, which is carried out through an auto-restart module. In case of a power failure, the module memorizes the set conditions before the power failure. The unit will resume the previous operation setting (not including Swing function) automatically after 3 minutes when power is restored.

If the memorization condition is forced cooling mode, the unit will run in cooling mode for 30 minutes and turn to auto mode as 75°F/24°C set temp.

If A/C is off before power off and A/C is required to start up, the compressor will have a 1 minute delay. All other conditions, the compressor will have 3 minutes delay when restarts.

8.4.10 Automatic front panel function:

8.4.10.1 The automatic front panel is forced to turn to the moves to closed position at an angle of 50°when the unit is turned off and is not affected by any signal from remote controller.

8.4.10.2 When the unit is turned on, the panel opens automatically at an angle of 50°, then the horizontal louver will open.

8.4.10.3 When the unit is turned off, the panel is closed automatically at an angle of 50°, then the horizontal louver will close.

8.4.10.4 If the panel requires moving while the horizontal louver is operating, the horizontal louver will stop and then carry out the action of the panel. After ending the action of the panel, the horizontal louver will continue its action.

8.4.11 Ionizer (Clean Air) function

8.4.11.1 Clean Air function is available only when the A/C is on, and it’s controlled through remote controller.

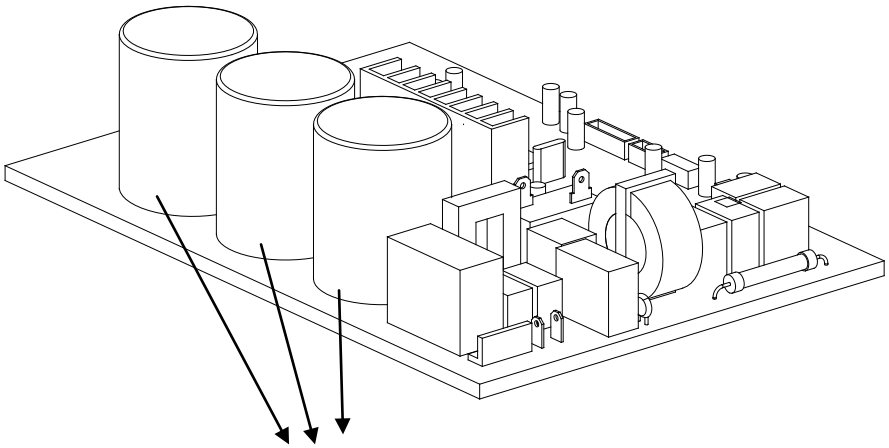
8.4.11.2 After the A/C is turned on, the Clean Air function is switched on when the A/C receives FRESH CODE the first time, and ionizer is switched off when the A/C receives the CODE again. 8.4.11.3 After starting the Clean Air function, the ionizer will work only when the indoor fan motor is running. If the indoor fan motor is off, the ionizer also stops working, even though the Clean Air function is available.

8.4.11.4 Switching the run mode will not stop the ionizer. When turning off the A/C, the ionizer is also turned off.

9. Troubleshooting

Safety

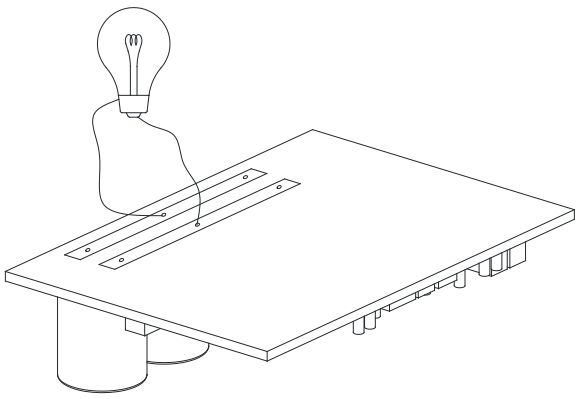
Because of there are capacitors in PCB electrical power is stored in the capacitors, do not forget to discharge the capacitor.



Electrolytic Capacitors

(HIGH VOLTAGE! CAUTION!)

Bulb (25-40W)



9.1 Indoor Unit Error Display

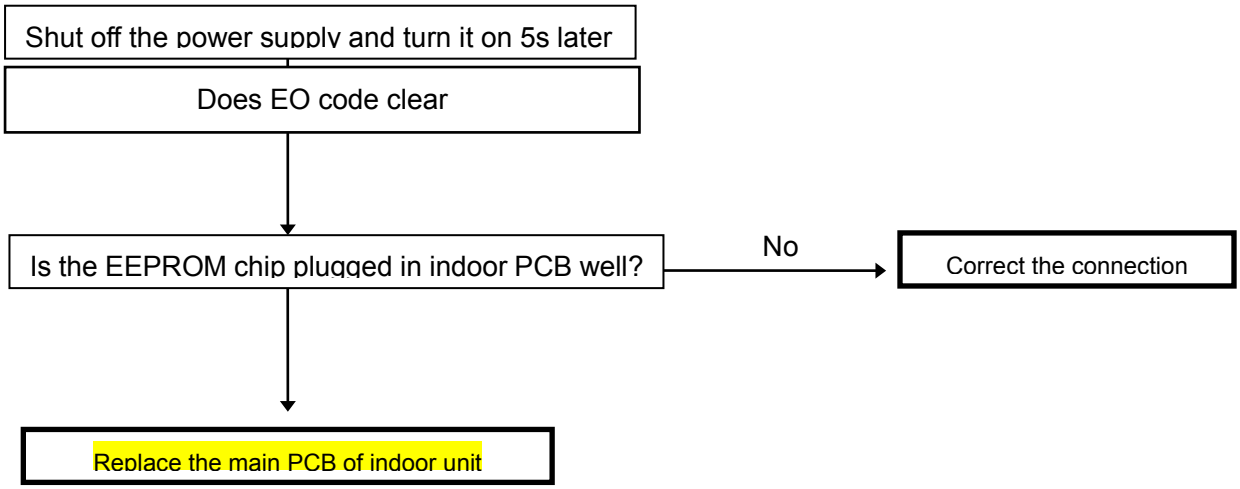
Display	LED STATUS
E0	EEPROM parameter error
E1	Indoor / outdoor units communication protection
E2	Zero-crossing signal error
E3	Indoor fan speed out of control
E5	Open or short circuit of outdoor temperature sensor
E6	Open or short circuit of room or evaporator temperature sensor
E7	Outdoor fan speed out of control
P0	IBM malfunction or IGBT over-strong current protection
P1	Over voltage or too low voltage protection
P2	Temperature protection of compressor top.
P3	1 outdoor temp below 5°F(-15°C)
P4	Inverter compressor drive error

Note: E4 & P3: Reserved function

9.2 Diagnosis and Solution

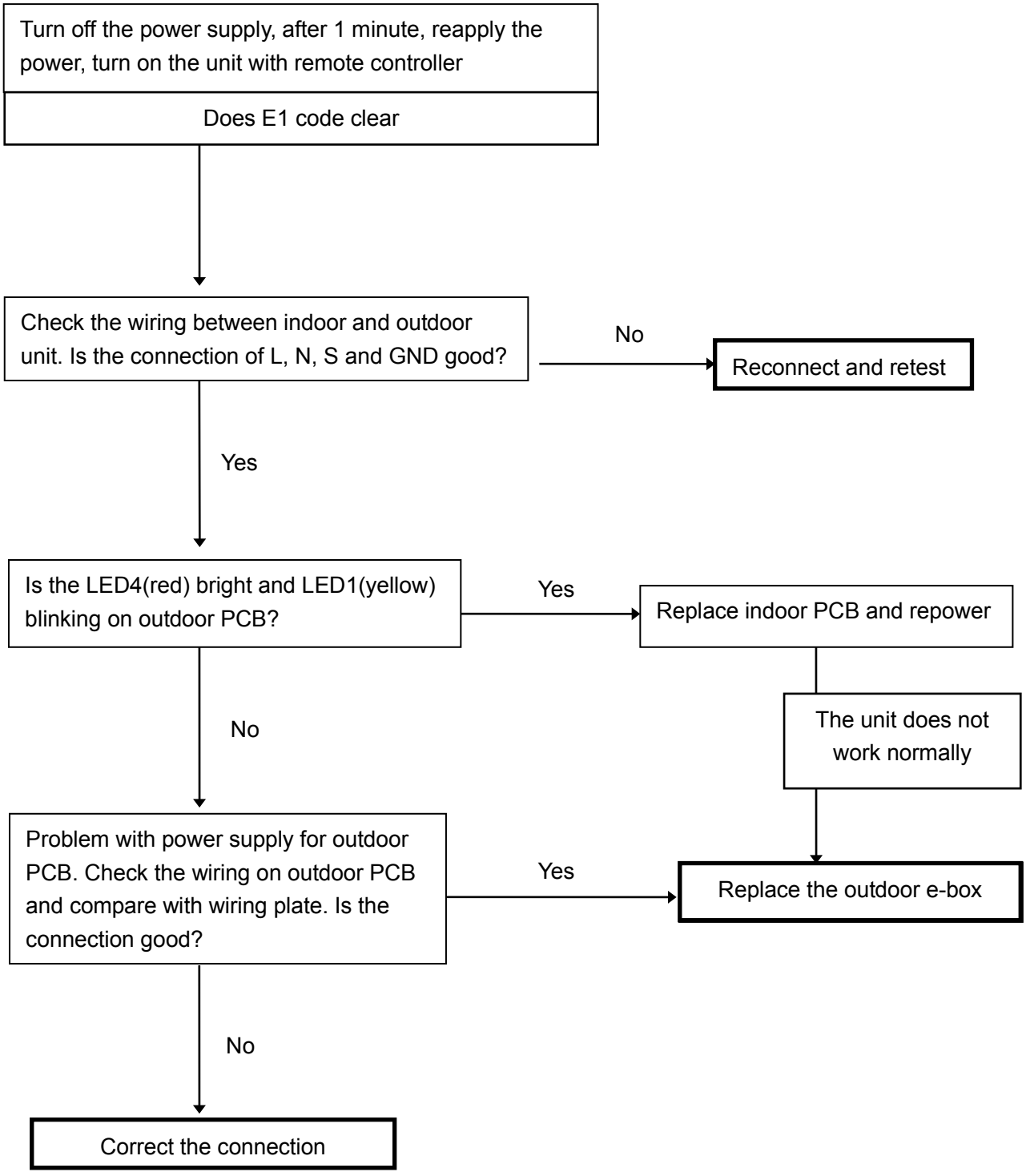
EO:

9.2.1 EEPROM parameter error diagnosis and solution


Shut off the power supply and turn it on 5s later
Does EO code clear
Is the EEPROM chip plugged in indoor PCB well?
No
Correct the connection
Replace the main PCB of indoor unit

E1:

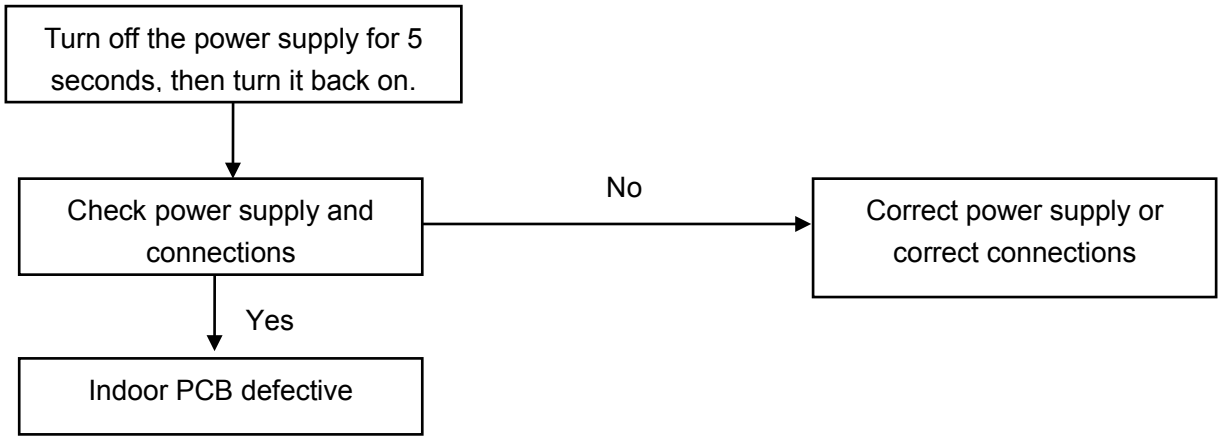
9.2.2 Indoor unit and outdoor unit communication protection error diagnosis and solution


Turn off the power supply, after 1 minute, reapply the power, turn on the unit with remote controller
Does E1 code clear
Check the wiring between indoor and outdoor unit. Is the connection of L, N, S and GND good?
No
Reconnect and retest
Yes
Is the LED4(red) bright and LED1(yellow) blinking on outdoor PCB?
Yes
Replace indoor PCB and repower
The unit does not work normally
No
Problem with power supply for outdoor PCB. Check the wiring on outdoor PCB and compare with wiring plate. Is the connection good?
Yes
Replace the outdoor e-box
No
Correct the connection

E2:

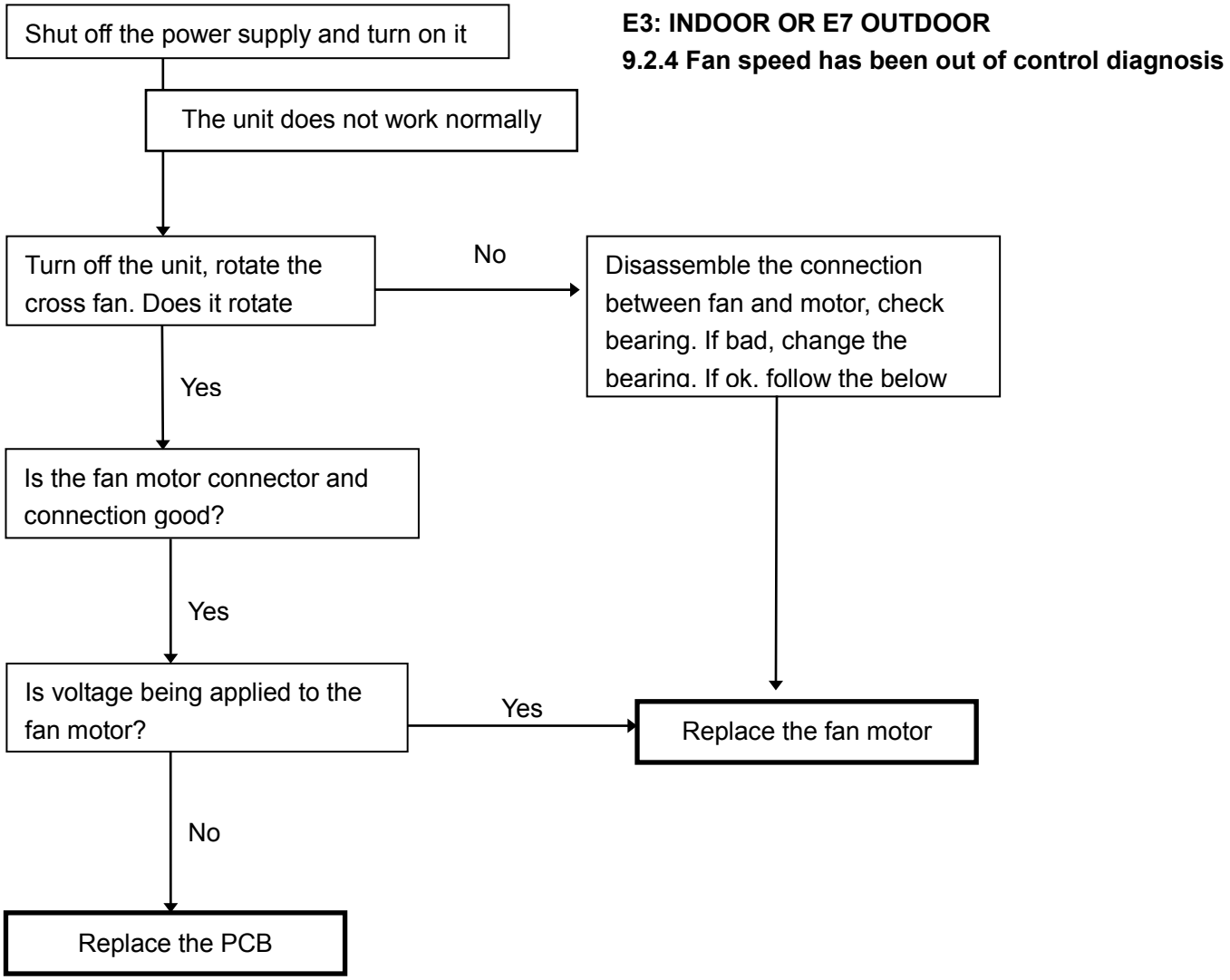
9.2.3 Zero crossing check resistance or inverter compressor, it is .7Ω error

Alarm signal when the main chip can't detect over-zero signal. When such failure occurs, the main control board must have fault.


Turn off the power supply for 5 seconds, then turn it back on.
Check power supply and connections
No
Correct power supply or correct connections
Yes
Indoor PCB defective

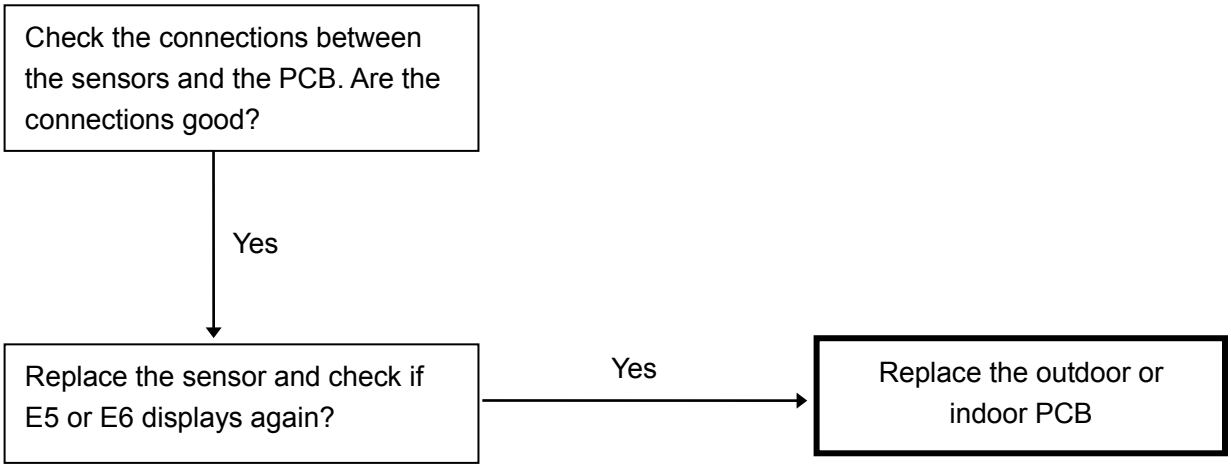
E3: INDOOR OR E7 OUTDOOR

9.2.4 Fan speed has been out of control diagnosis


Shut off the power supply and turn on it
The unit does not work normally
Turn off the unit, rotate the cross fan. Does it rotate
No
Disassemble the connection between fan and motor, check bearing. If bad, change the bearing. If ok, follow the below
Yes
Is the fan motor connector and connection good?
Yes
Is voltage being applied to the fan motor?
Yes
Replace the fan motor
No
Replace the PCB

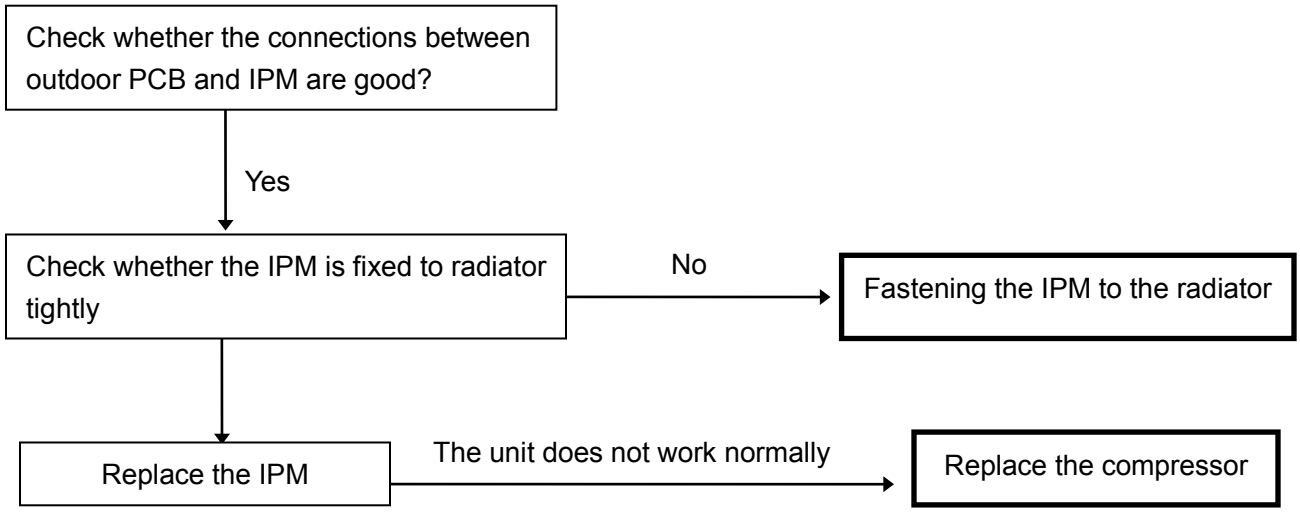
E5 & E6

9.2.5 Open or short circuit of temperature sensor diagnosis and solution


Check the connections between the sensors and the PCB. Are the connections good?
Yes
Replace the sensor and check if E5 or E6 displays again?
Yes
Replace the outdoor or indoor PCB

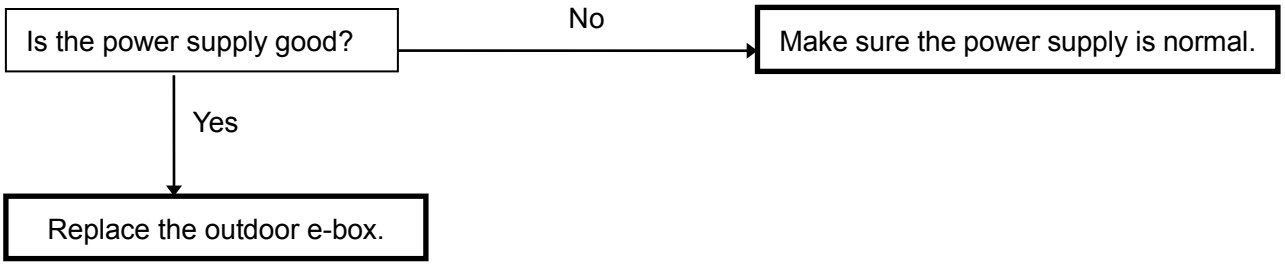
P0:

9.2.6 IGBT over current protection diagnosis and solution


Check whether the connections between outdoor PCB and IPM are good?
Yes
Check whether the IPM is fixed to radiator tightly
No
Fastening the IPM to the radiator
Replace the IPM
The unit does not work normally
Replace the compressor

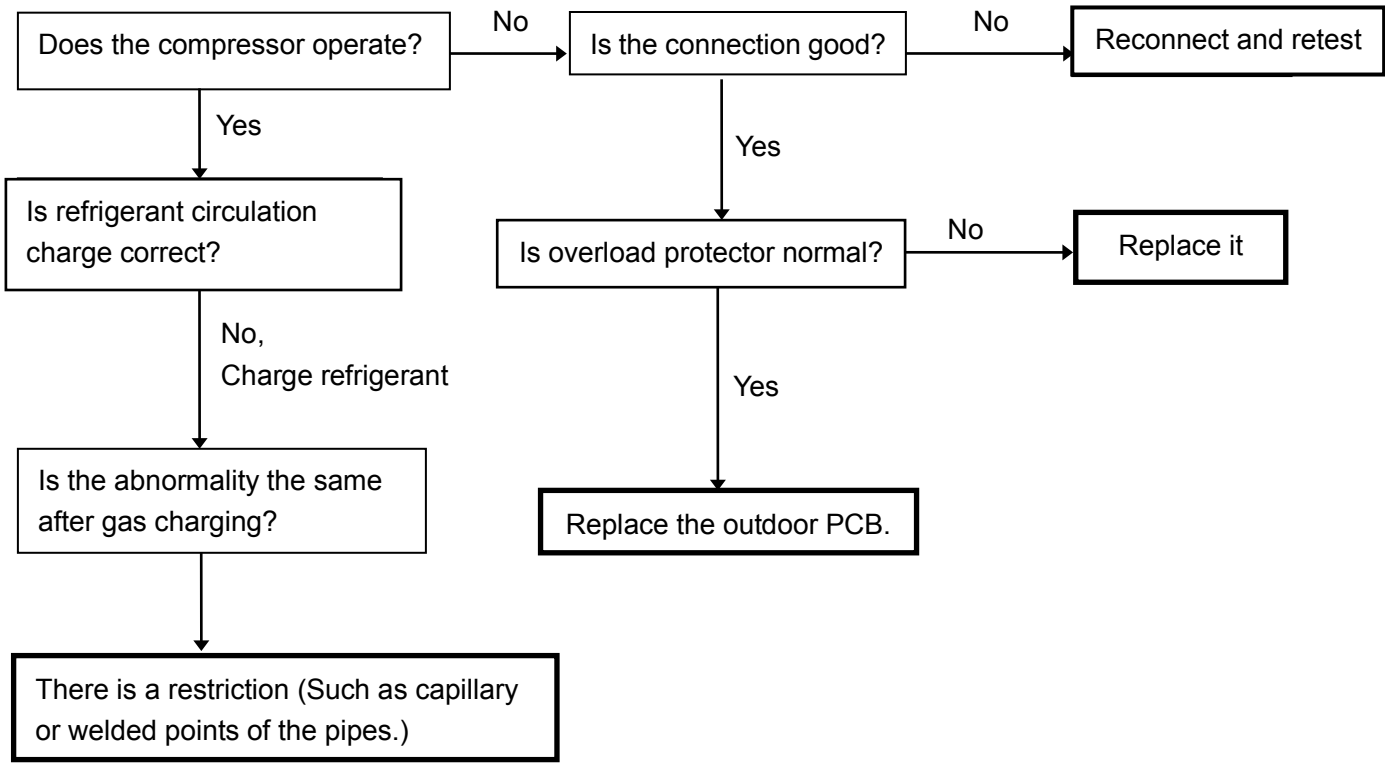
P1:

9.2.7 Over voltage or too low voltage protection diagnosis and solution



P2:

9.2.8 High temperature protection of compressor top diagnosis and solution

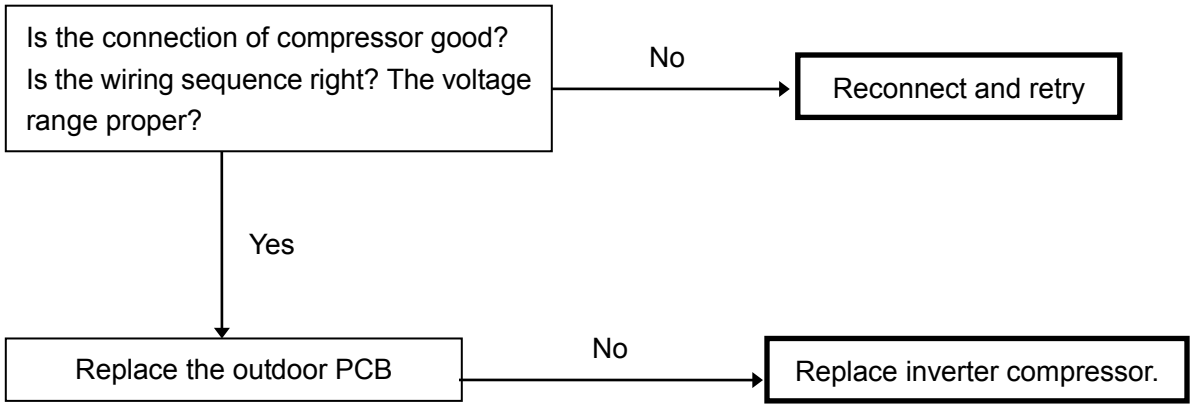


9.29 P3 ERROR – Low Ambient Protection

If the outdoor temperature remains at 5°F(-15°C) for an hour, the compressor will turn off and the error code “P3” will be displayed on the indoor unit. Once the compressor has been off for at least an hour and the temperature outside is equal to or greater than 10.4°F(-12°C) for at least ten minutes, the system will restart. Additionally if the outside temperature reaches at least 41°F(5°C) for at least ten minutes, the system will restart without the needed 1 hour compressor off time required.

P4:

9.2.10 Inverter compressor drive error diagnosis and solution


Is the connection of compressor good? Is the wiring sequence right? The voltage range proper?
No
Reconnect and retry
Yes
Replace the outdoor PCB
No
Replace inverter compressor.

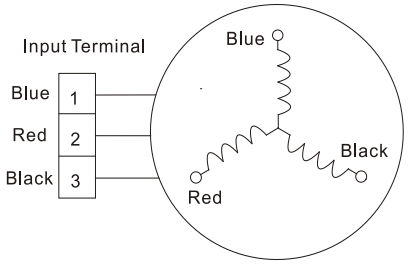
9.2.9 Zero crossing check resistance or inverter compressor, it is .7Ω error

Alarm signal when the main chip can’t detect over-zero signal. When such failure occurs, the main control board must have fault.

Key parts checking.

8.3.1. Compressor checking (Model: DA108X1C-20FZ3)

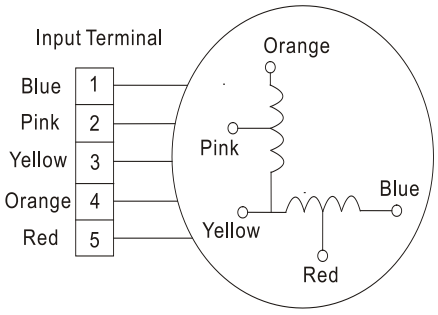
Measure the resistance value of each winding by using the multi-meter.



Position	Resistance Value
Blue - Red	0.71Ω (20℃)
Blue - Black	
Red - Blue	

Step Motor (Model: MP2835T)

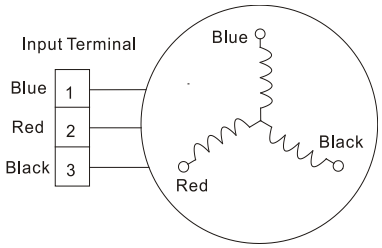
Measure the resistance value of each winding by using the multi-meter.



Position	Resistance Value
Black - Red	56.5Ω (20℃)
Red -Yellow	117.5Ω (20℃)

8.3.1. Compressor checking (Model: DA150S1C-20FZ)

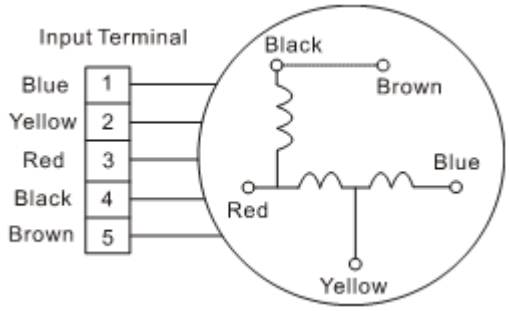
Measure the resistance value of each winding by using the multi-meter.



Position	Resistance Value
Blue - Red	0.95Ω (20℃)
Blue - Black	
Red - Blue	

Outdoor Fan Motor (Model: YDK53-6FB)

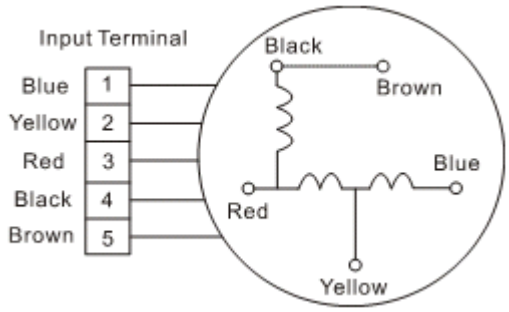
Measure the resistance value of each winding by using the multi-meter.



Position	Resistance Value
Black - Red	56Ω (20℃)
Red -Yellow	76Ω (20℃)

Outdoor Fan Motor (Model: YDK53-6NB)

Measure the resistance value of each winding by using the multi-meter.



Position	Resistance Value
Black - Red	56.5Ω (20℃)
Red -Yellow	117.5Ω (20℃)

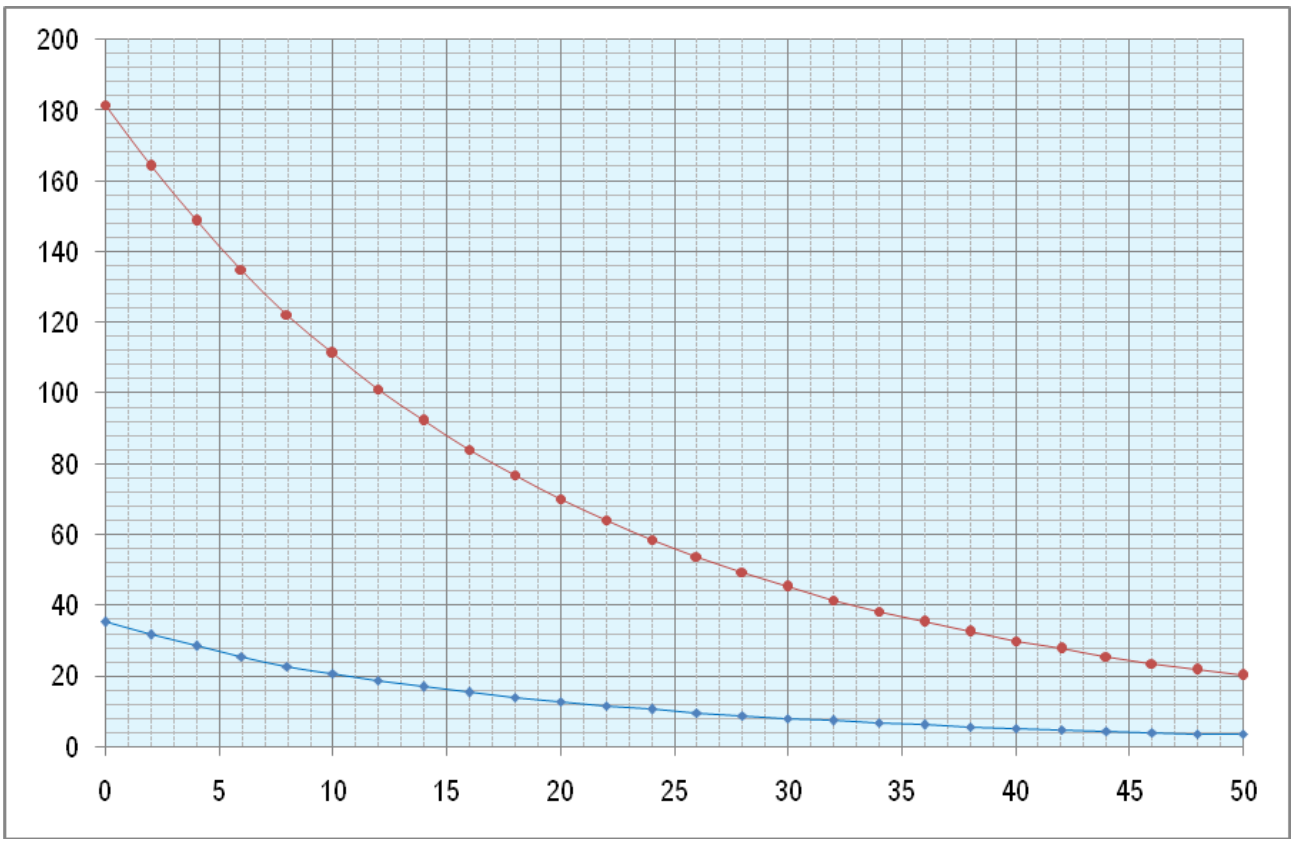
Room temp.(T1) sensor,
Indoor coil temp.(T2) sensor,
Outdoor coil temp.(T3) sensor,
Outdoor ambient temp.(T4) sensor,
Compressor exhaust temp.(Te) sensor.
Measure the resistance value of each winding by using the multi-meter.

Some frequently-used R-T data for Te sensor:

Temperature (0°F)	41°F/5°C	59°F/15°C	77°F/25°C	95°F/35°C	140°F/60°C	158°F/70°C	176°F/80°C	194°F/90°C	212°F/100°C
Resistance Value (KΩ)	141.6	88	56.1	36.6	13.8	9.7	6.9	5	3.7

Some frequently-used R-T data for T1, T2, T3 and T4 sensor:

Temperature (0°F)	41°F/5°C	50°F/10°C	59°F/15°C	68°F/20°C	77°F/25°C	86°F/30°C	104°F/40°C	122°F/50°C	140°F/60°C
Resistance Value (KΩ)	26.9	20.7	16.1	12.6	10	8	5.2	3.5	2.4



Design, material, performance data and components
subject to change without notice.

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